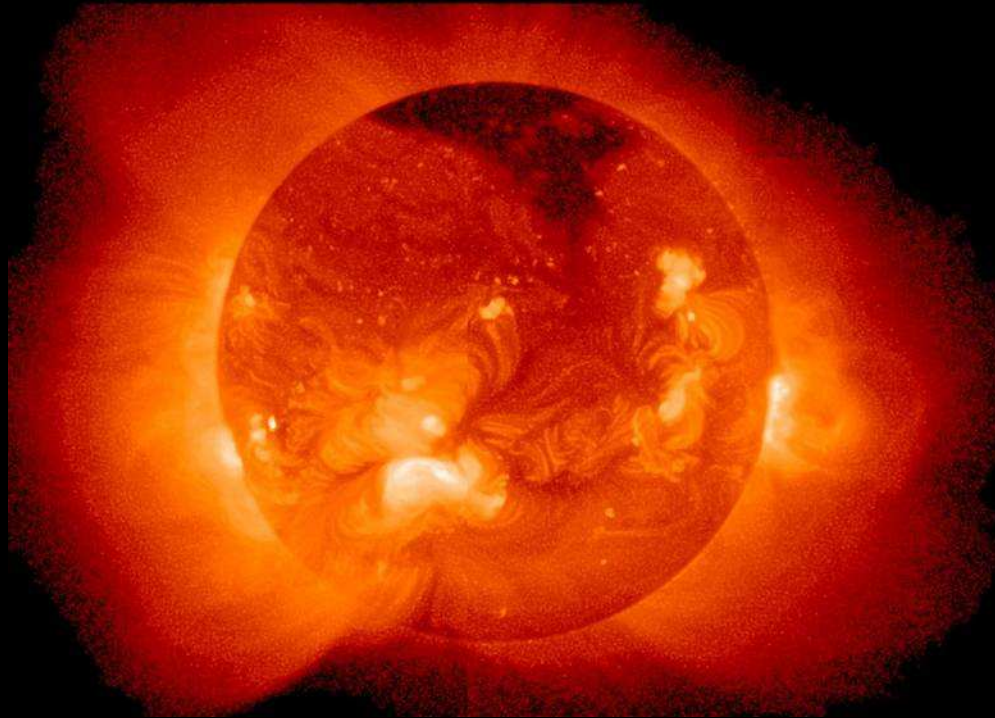


# THINKING BIG



WHAT DOES IT ALL MEAN?  
(an international perspective)

Teams of tigers are extremely dangerous. I must flee this roof or risk being torn apart by their horrible claws.

This guy's PV policy is CRAZY! I need to get off this roof...





# Thinking Big means...



...tired, but accurate, metaphors



AND ADMITTING THAT IT'S ALRIGHT TO GET CRAZY

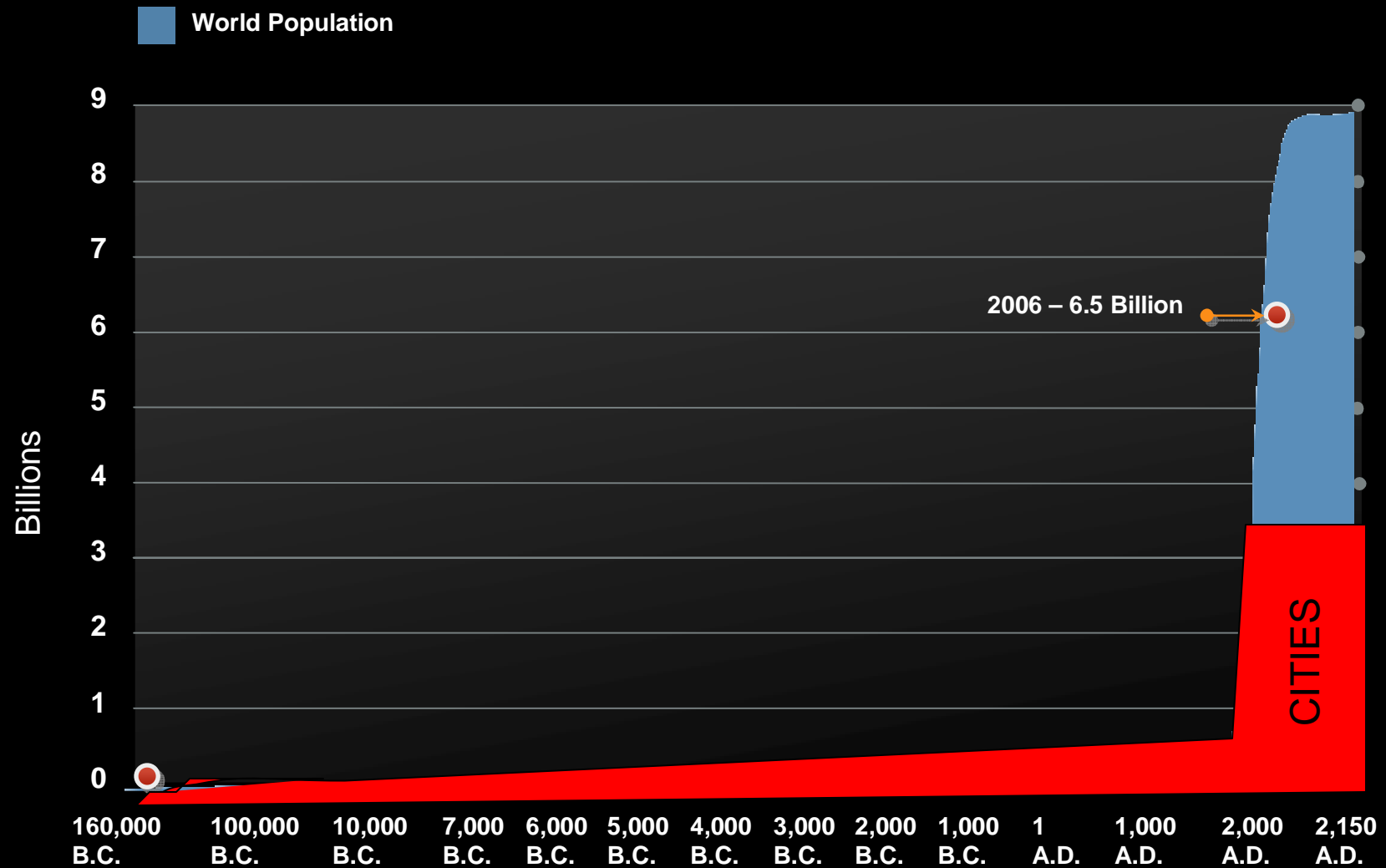


SOLAR CITY, USA = 3<sup>rd</sup> LARGEST STATE IN THE UNION  
(22 million strong... and growing)



THE POWER TO RESHAPE CITIES

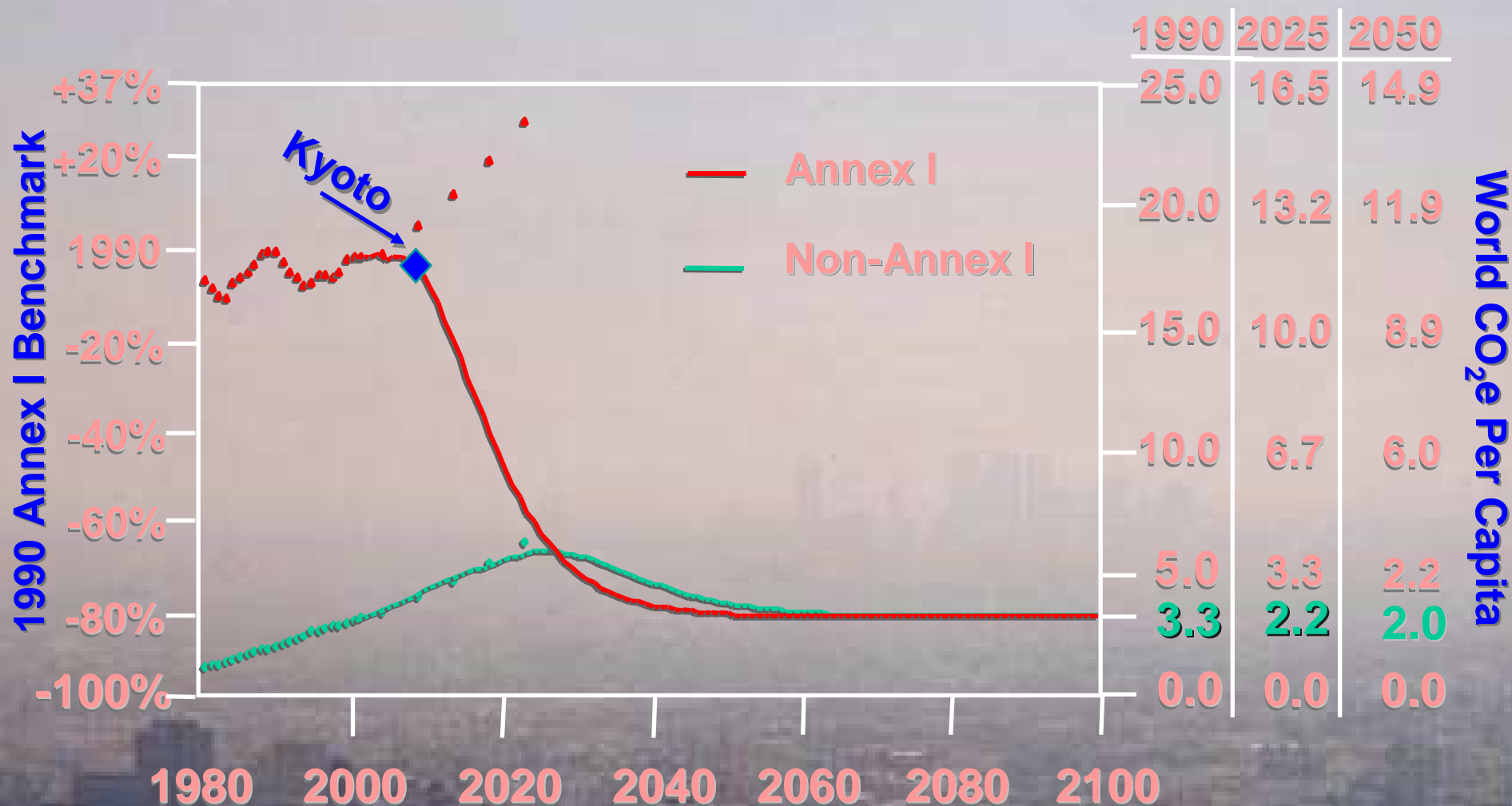
# Over Half the World now lives in Cities



Source: Based on data from United Nations as presented by Al Gore; Flavin (2007)

# World GHG Emissions Reduction Scenario

## 60% Reduction from World 1990 Levels by 2050



Source: Based on John Byrne et al (2004) "Reclaiming the atmospheric commons: Beyond Kyoto." In V.I. Grover (ed.), *Climate Change: Perspectives Five Years After Kyoto*. Chapter 21. Plymouth, UK: Science Publishers, Inc.



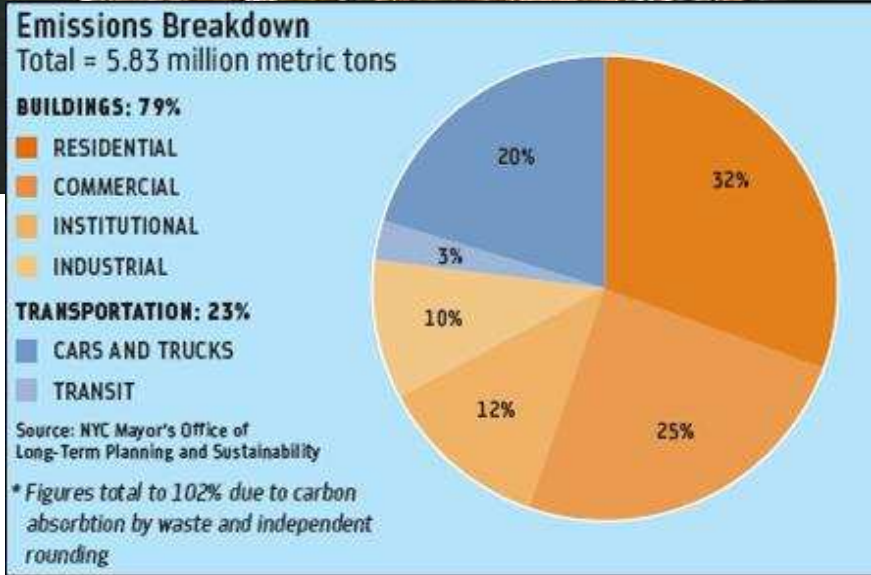
**Center for Energy and Environmental Policy**



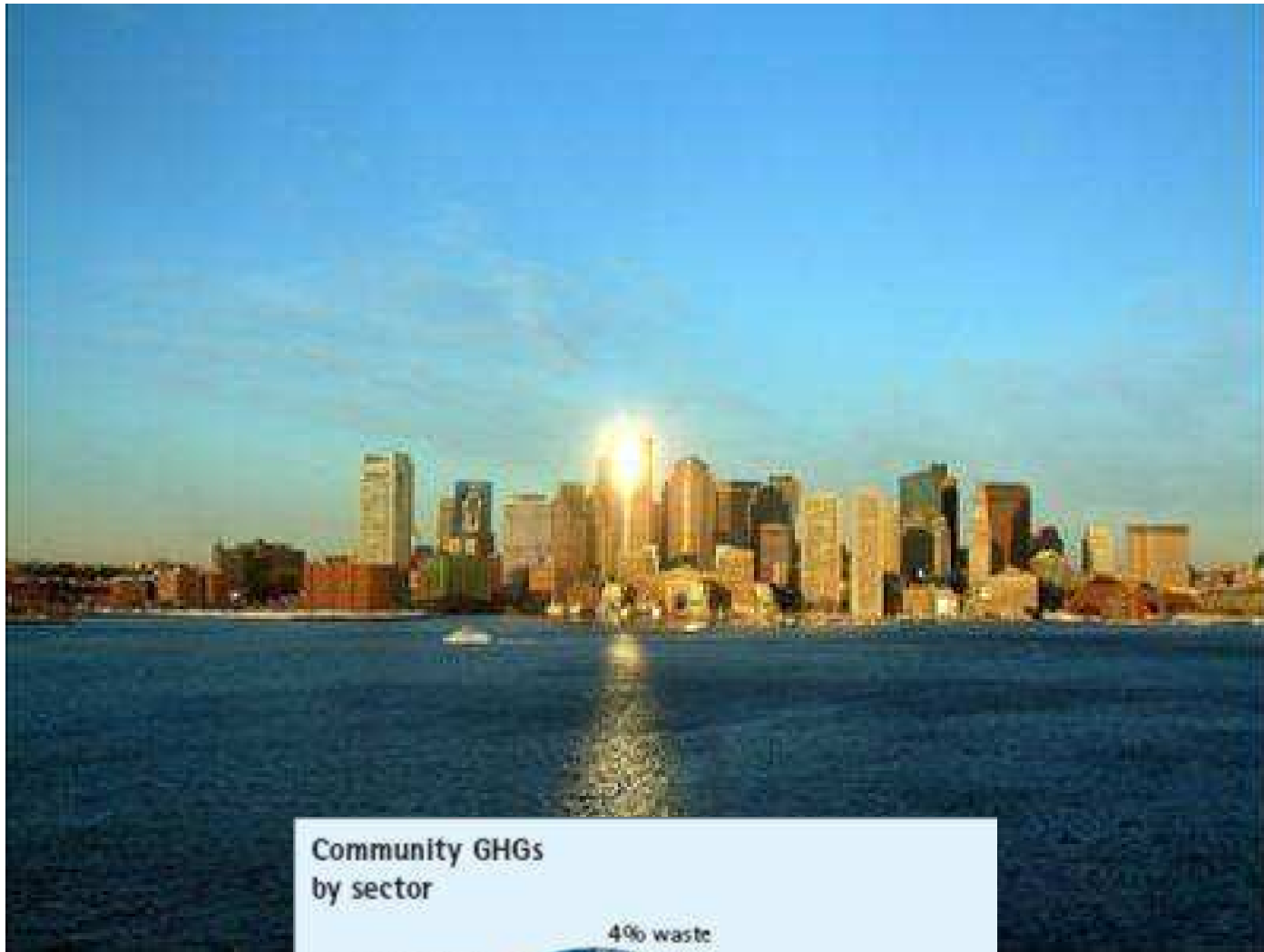


United Nations Environment Programme:  
40% of greenhouse gases from buildings

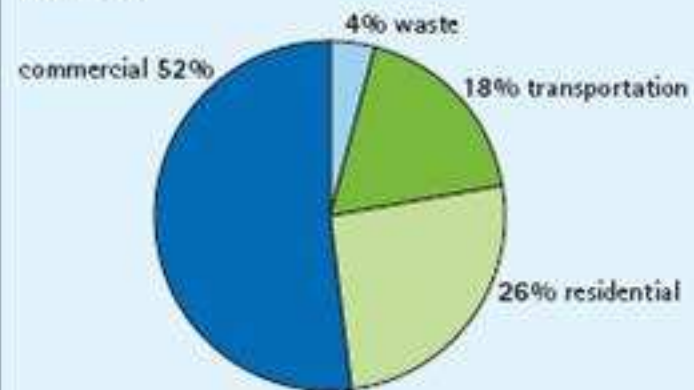




79%



Community GHGs  
by sector



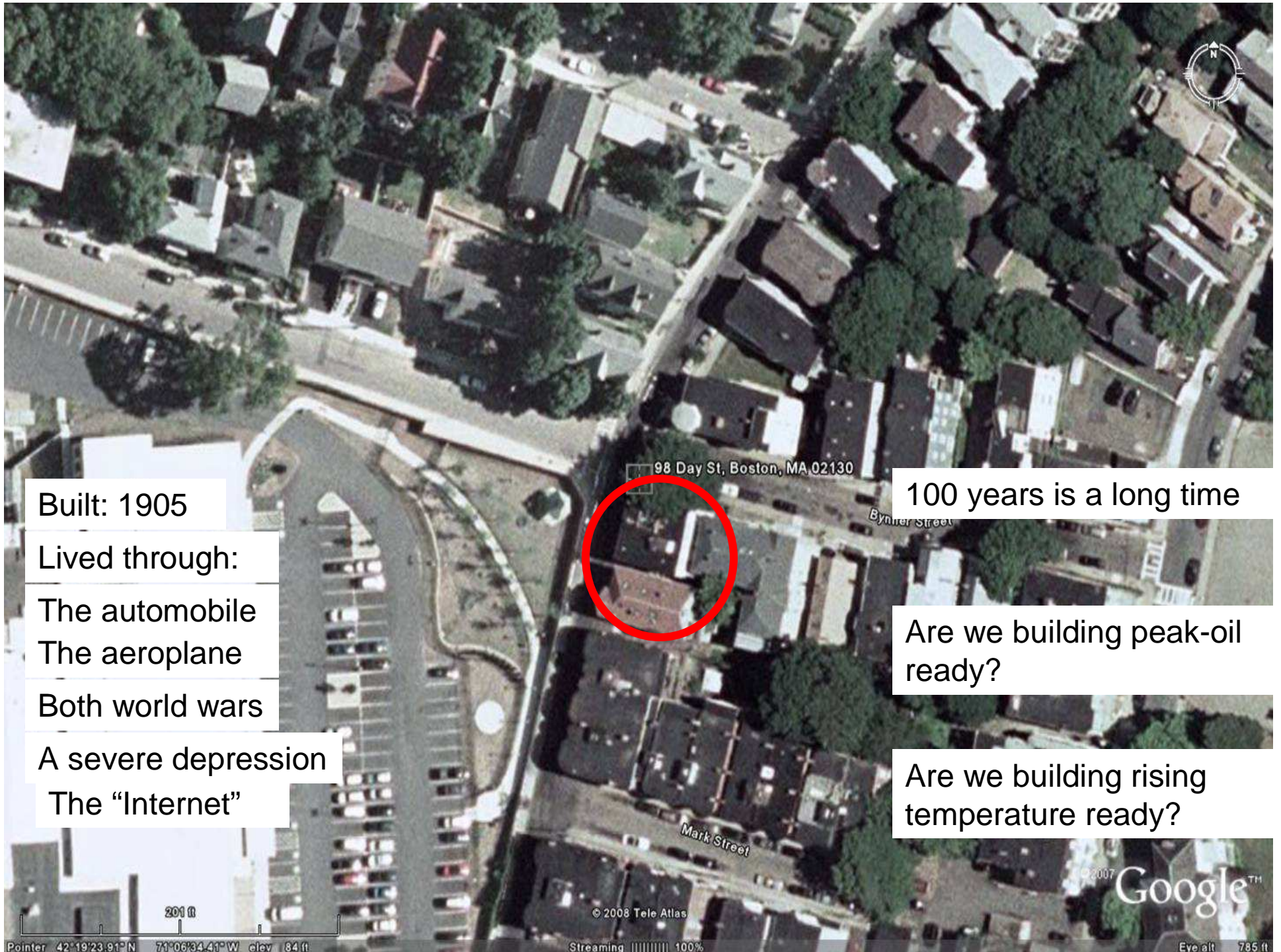
Source: City of Boston

78%



WE NEED TO BUILD EVERY  
BUILDING CARBON ZERO  
STARTING TODAY...

BUT EVEN IF WE DO....



Built: 1905

Lived through:

The automobile

The aeroplane

Both world wars

A severe depression

The "Internet"

100 years is a long time

Are we building peak-oil ready?

Are we building rising temperature ready?

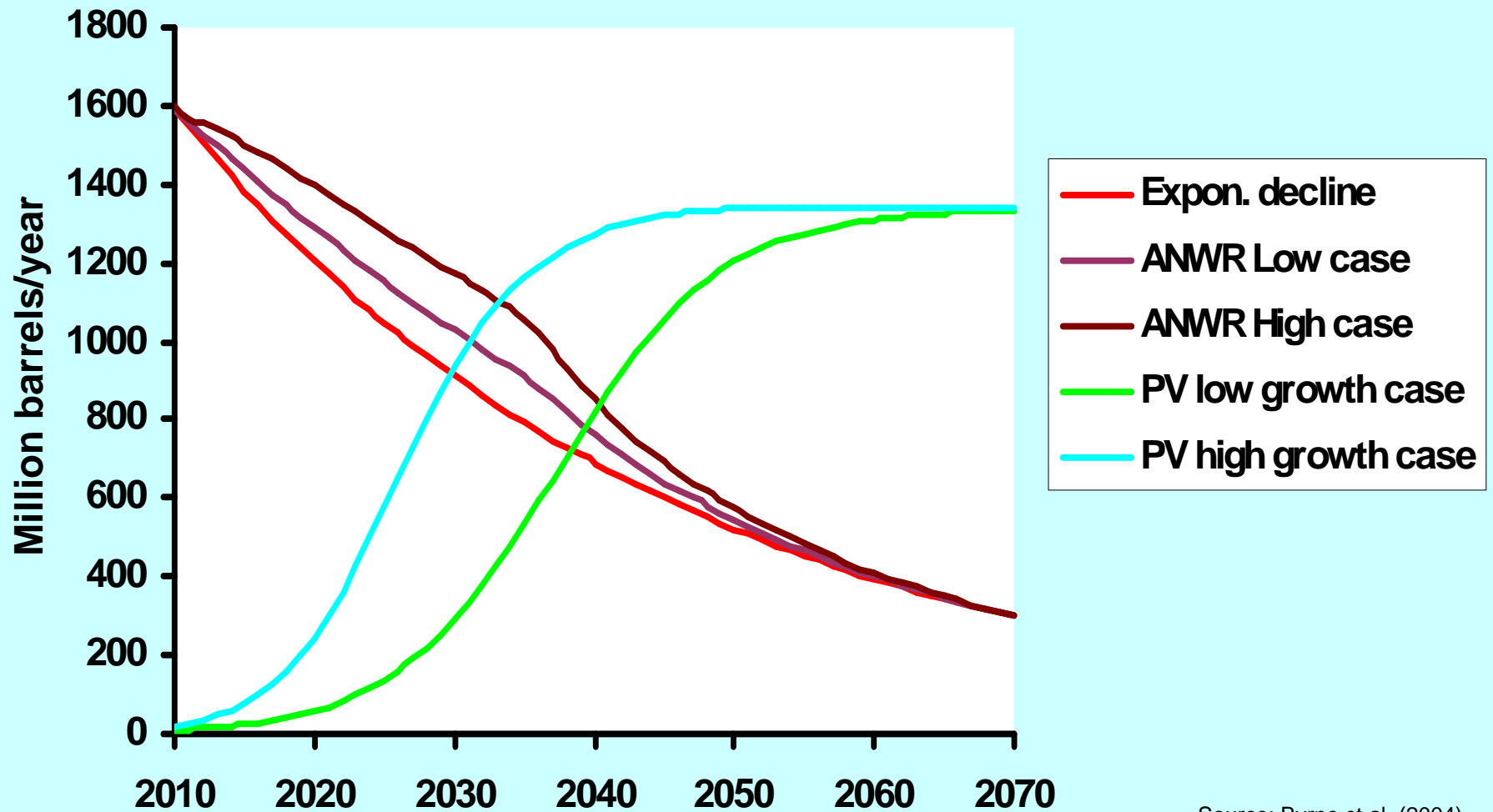
Pointer 42°19'23.91"N 71°06'34.41"W elev 84 ft

© 2008 Tele Atlas  
Streaming 100%

2007 Google™

Eye alt 785 ft

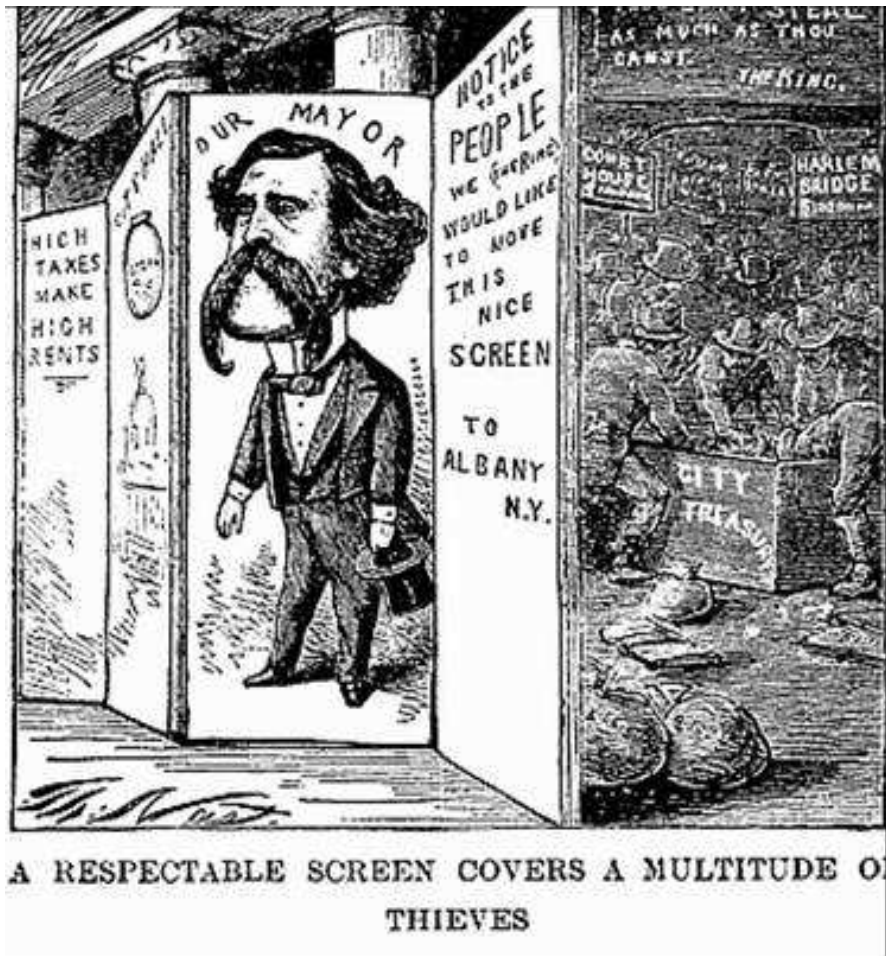
# SOLAR ENERGY: THE PERFECT RESOURCE FOR OUR URBAN FUTURE



Source: Byrne et al. (2004)



## The Way it Was....



\*No relation to DOE Tiger Teams

# THE PRESSURE COOKER of Municipal Innovation



# Case #1: Aachen, Germany





# The Year was 1992...

“It’s true that there are relatively few privately owned solar facilities in operation today. The main reason is that...those who produce solar electricity still pay a lot more for their power than those who don’t.”

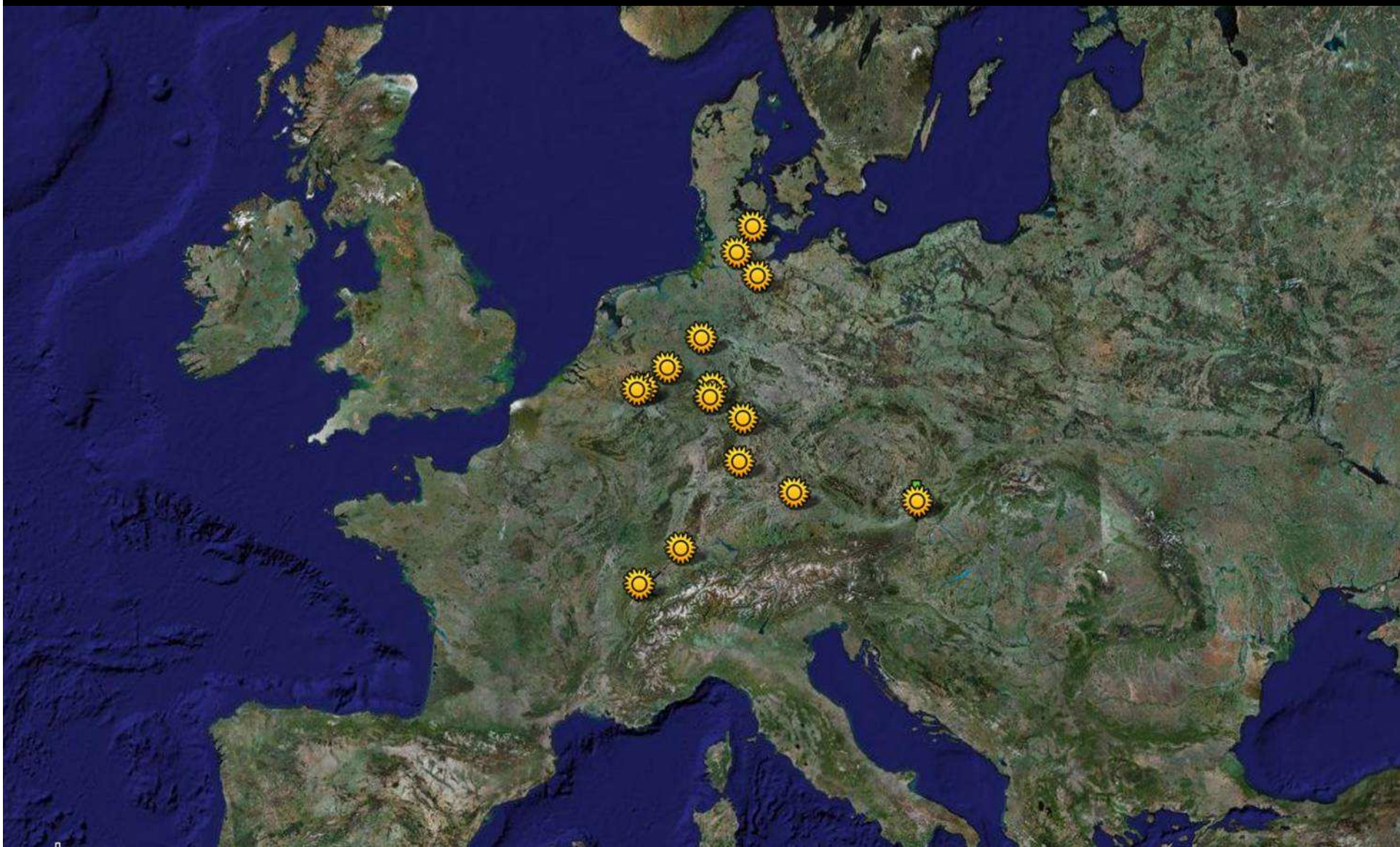
“This situation could be changed if the operators of solar facilities were paid for the electricity they fed into the grid at a price that would cover their costs just as at any other power plant.”

PV Contracts:

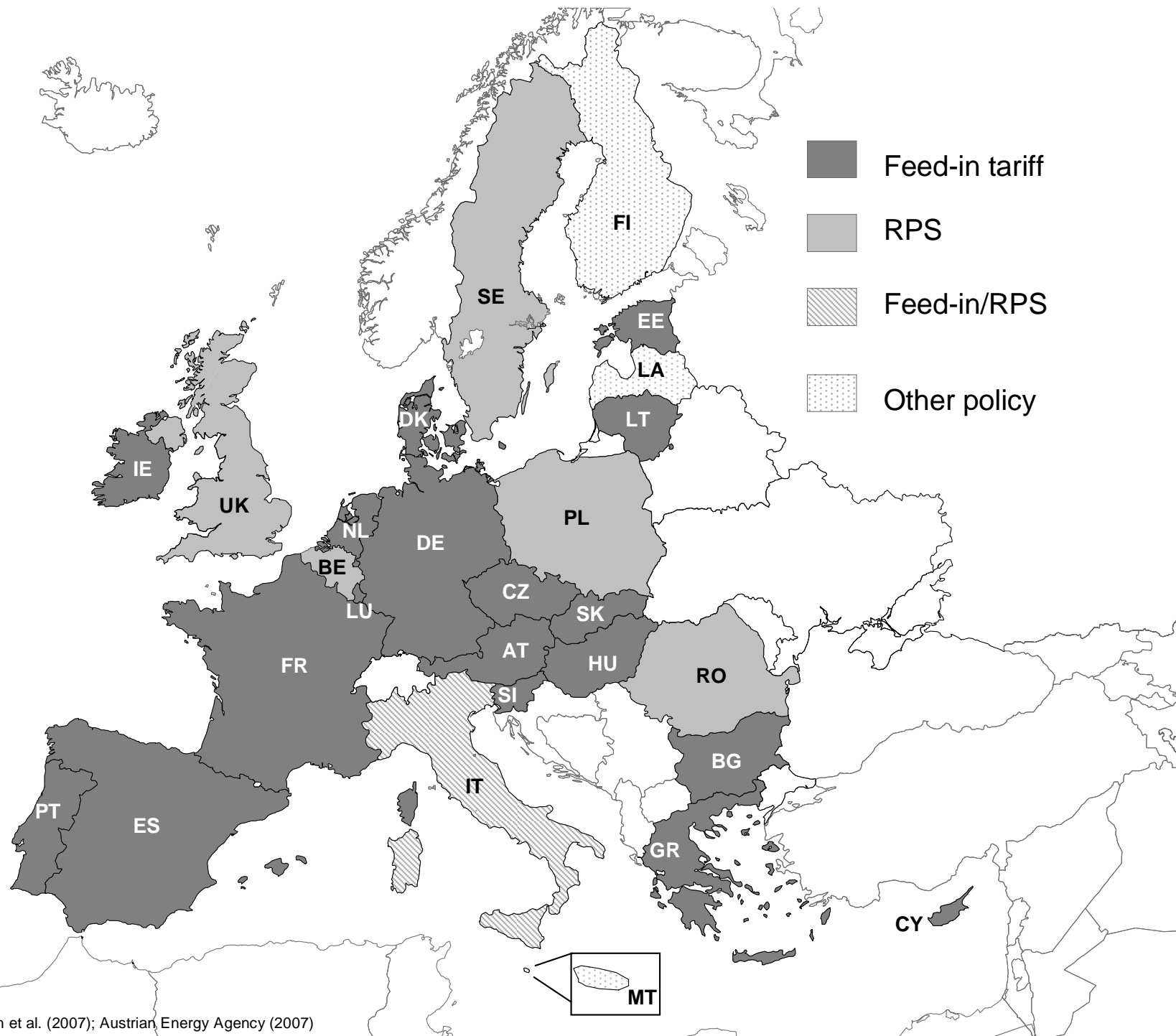
20 years

2 Deutsch Marks

\$1.34/kWh



Source: Rickerson, based on Solarenergie-Förderverein (1994)

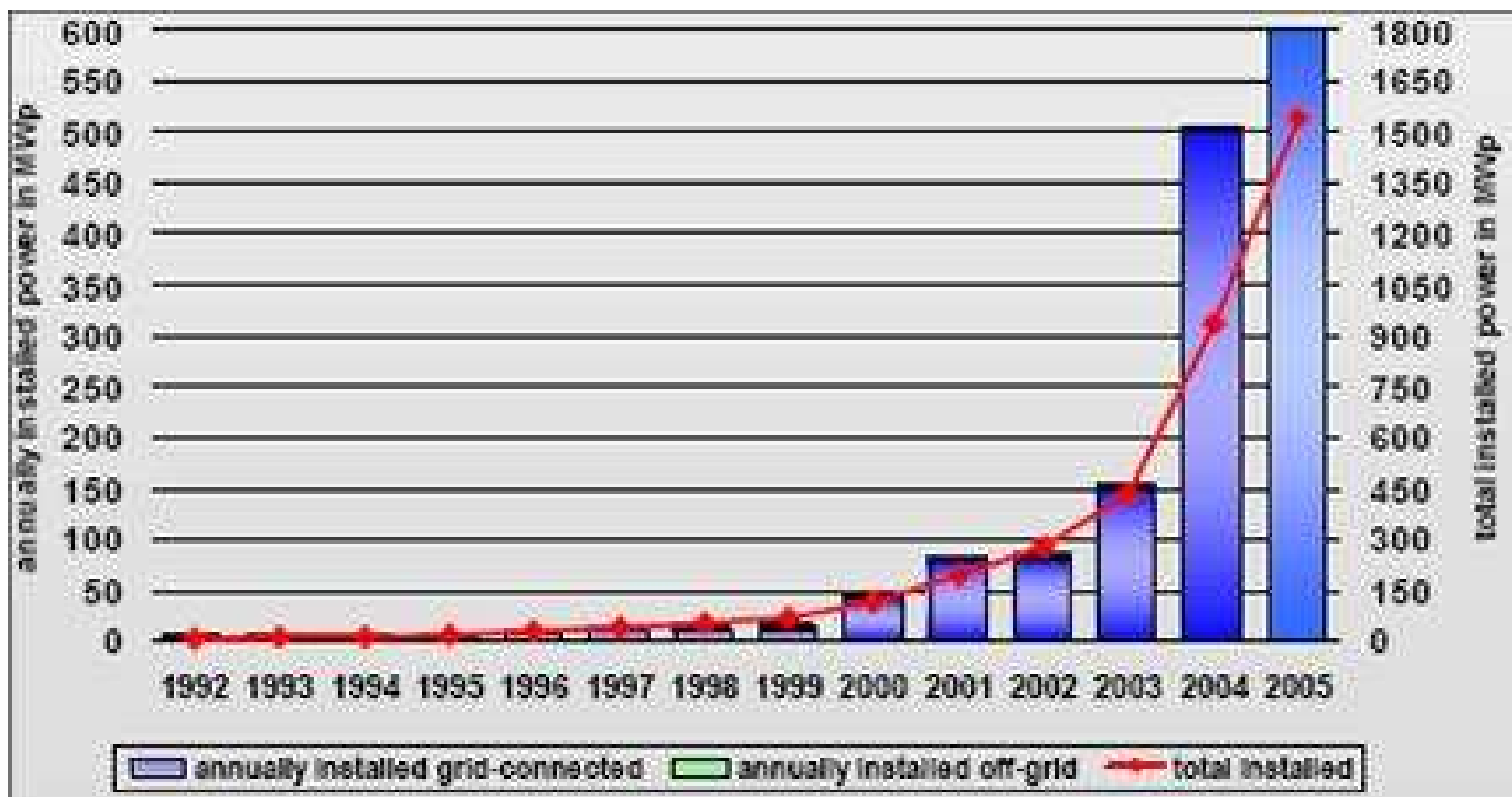


Sources: Klein et al. (2007); Austrian Energy Agency (2007)



Country	€cents	Contract
Germany	40.6-56.8	20
Spain	23-44	project life
France	30-55	20
Italy	44.5-49	20
Portugal	31-45	15
Cyprus	21.1-39.3	15
Czech Republic	45.5	15
Austria	47-60	13
Greece	40-50	12
Luxembourg	28-56	10

Source: Gipe (2008); Morthorst et al. (2005)



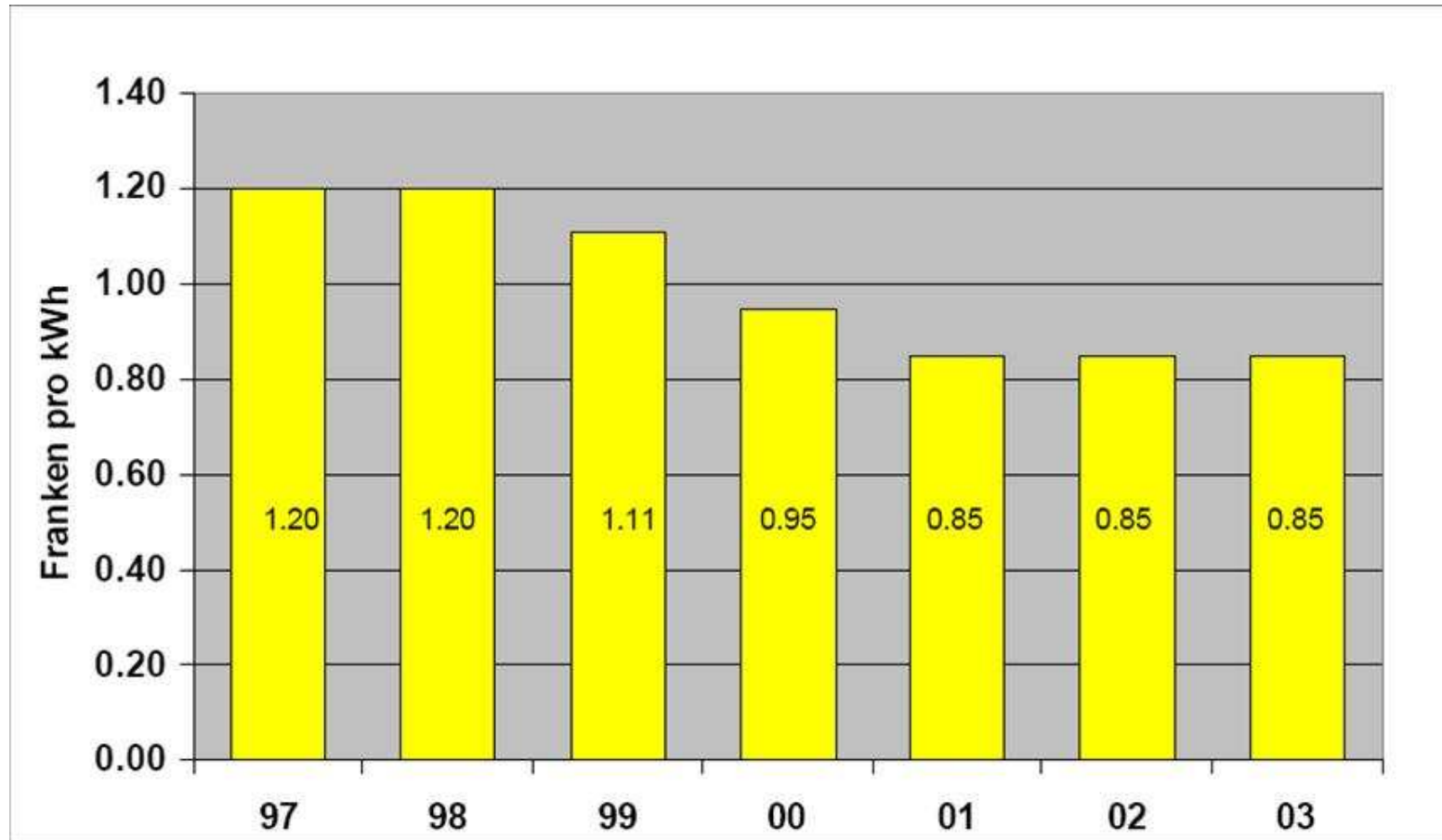
Source: Stryi-Hipp (2006)

# Case #2: Zurich





# Voluntary Solar Market (aka the Solar Stock Exchange)



0.85 Swiss Franks = \$0.61/kWh (2003 \$)

Source: Bébié (2005)

Number of PV-plants: 68

Planned PV-plants: 18

Installed capacity mar 04: 2.4 MW

Installed capacity dec 04: 3.1 MW

Annual production 03: 2'440 MWh

Annual energy yield: 963 kWh/kW



Source: Bébié (2005)

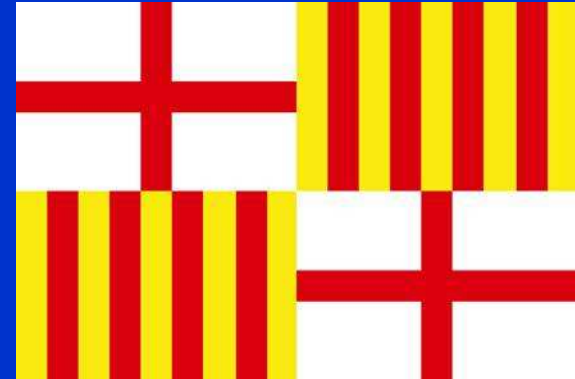
# Case #3: Barcelona





# Solar Thermal Obligation

- Passed 1999, strengthened in 2006
- All new construction and major renovation must include solar water heating for 60%-70% of their demand
- From 1,650 m<sup>2</sup> to 31,050 m<sup>2</sup> (i.e. 21.7 MW<sub>th</sub>) in less than 5 years.





Source: Rickerson, based on ESTIF (2007); Puig i Boix (2002)

# Spain and Beyond

- **National law** in Spain in 2006 (second after Israel in 1980)
- Best practice diffusion among cities (Barcelona-Madrid-Barcelona)
- Diffusing to Portugal, Germany, Ireland, Italy, and beyond?

# Case Study #四: CHINA

## EVERYTHING YOU'VE HEARD IS TRUE

Electricity demand doubled between 2000 and 2006

China added 66 gigawatts in 2005

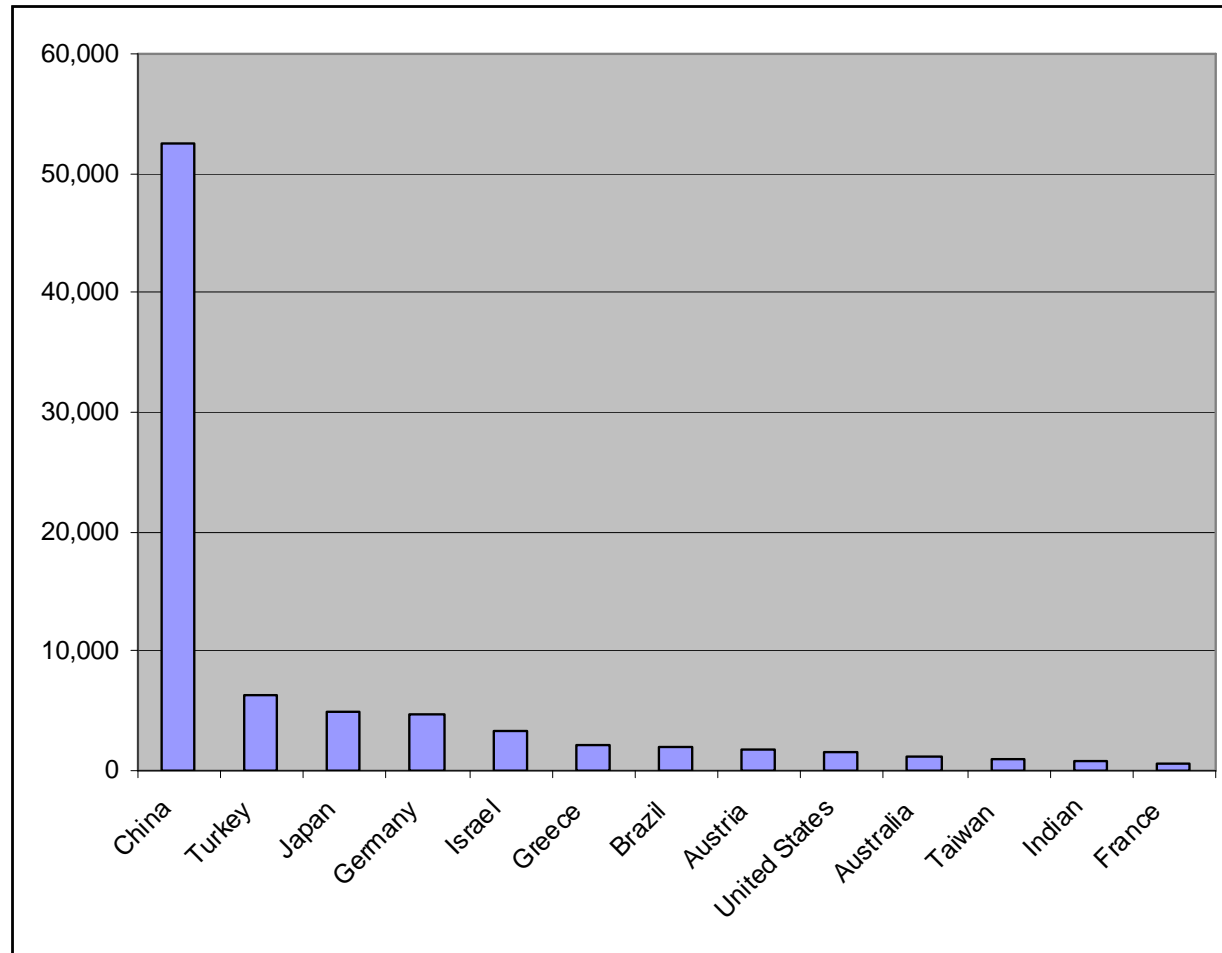
China added 105 gigawatts in 2006  
(That's France)

= TWO 600 MW COAL PLANTS EACH WEEK!

1% of China's 560 million urban citizens breath air that meets EU standards



# Solar Water Heating Capacity



Source: Weiss et al. (2007)

# Chinese Solar Cities

- Shanghai 100,000 roofs initiative (stalled)
- Shenzhen: SWH on all buildings below 12 stories
- Rizhao: 700 MW of SWH; 99% of residences in central district
- Dezhou....



# Home to Himin



Source: Himin

1 factory > all of EU SWH production capacity



**Hinin**





**Hinin**







Hinin





**Hinin**







Credit: Paradigma





Credit: Paradigma





Credit: Paradigma



Hinin



太阳能太阳能别墅

Solar energy villa









Hinin





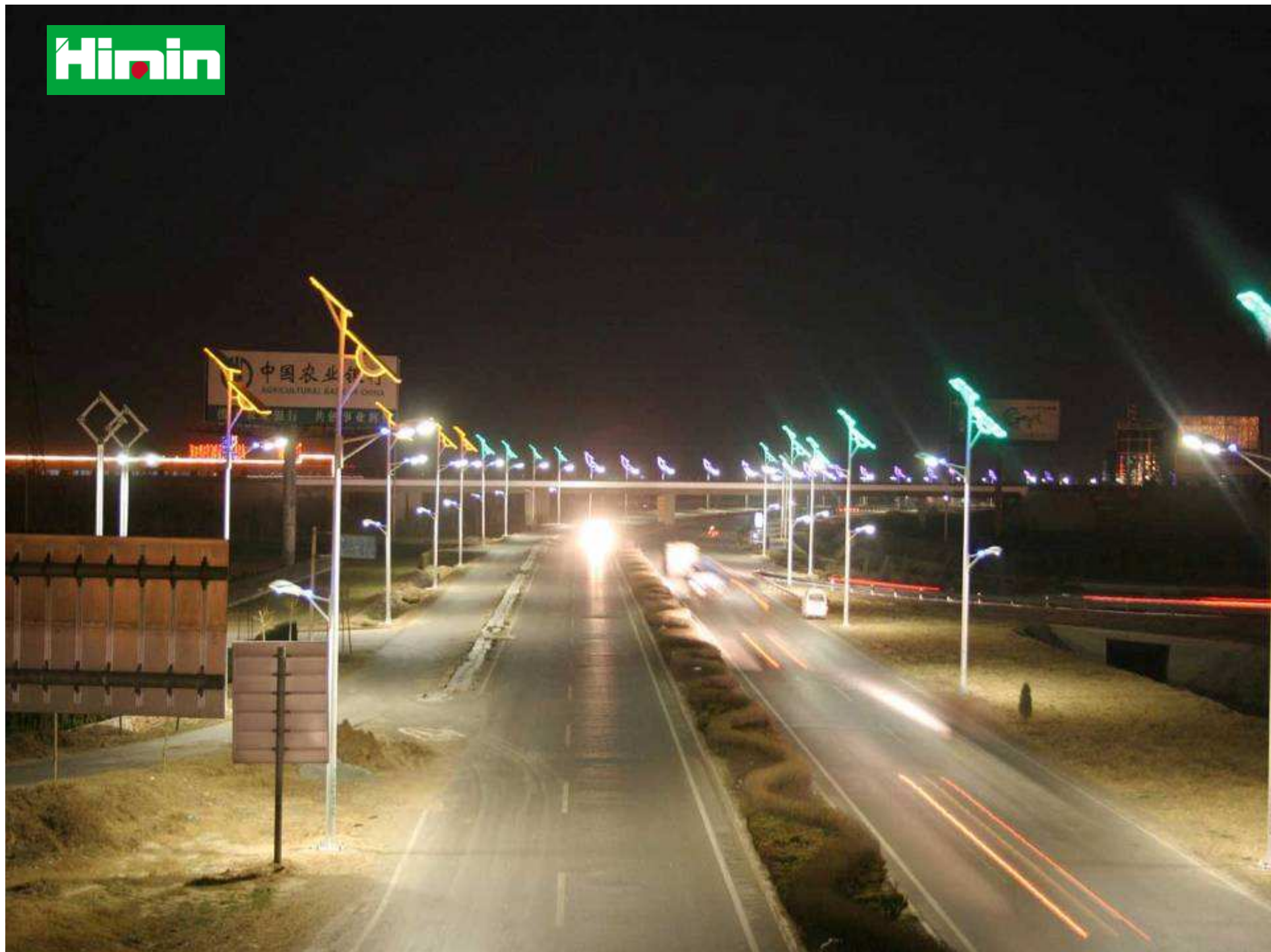
Hinin

德州国家级节能示范小区

*Dezhou State Energy Conservation Demonstration Area*









SO WHERE DOES THAT LEAVE US PRE-2009?



KEEP COOKIN'!

# QUESTIONS?



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